Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L20	2933	(MEMs or (micro adj electronic)) and ((suspended or colloidal) with solution)	US-PGPUB; USPAT	OR	ON	2005/06/11 15:38
L21	19	20 and SOI	US-PGPUB; USPAT	OR	ON	2005/06/11 15:38
L22	779	(MEMs or (micro adj electronic)) and ((suspended or colloidal) with solution)	USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/06/11 15:38
L24	16	22 and SOI	USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/06/11 15:38
L25	94	((rinse or rinsing) same solution same etching) and (MEMS or (micro adj (electronic or mechanical)))	US-PGPUB; USPAT	OR	ON	2005/06/11 16:02
L26	85	25 and @ad<"20031007"	US-PGPUB; USPAT	OR	ON	2005/06/11 16:02

US-PAT-NO: 6538296

DOCUMENT-IDENTIFIER: US 6538296 B1

TITLE: Micro-electro mechanical device made from mono-crystalline silicon and method of manufacture therefore

---------- KWIC ---------

Brief Summary Text - BSTX (5):

A micro-electro-mechanical system (MEMS) is a device that transforms mechanical activity into electrical signals and vice versa. A key element in MEMS is a suspended microstructure, which deflects in response to applied force to the microstructure or to a proof mass attached to it. The amount of deflection can be sensed electrically by capacitive plates coupled to surfaces of both the suspended mass and an adjacent structure or by piezoelectric or piezo-resistive layers formed on the microstructure. As the suspended mass deflects, the resulting change in capacitance or voltage from the sensing elements provides an electrical indication of the applied force. One example is an accelerometer that comprises a rectangular membrane, one side of which is fixed to a carrier while the other is suspended, and a means for detecting the movement of the membrane under the effect of acceleration. This constitutes a force sensor. Conversely, an electrical signal applied to the capacitive plates or piezoelectric layers can result in deflection in the suspended mass. This constitutes an actuator.

Brief Summary Text - BSTX (7):

Surface micro-machined MEMS devices are constructed entirely from thin films deposited on a sacrificial layer. These devices allow for monolithic integration with silicon processors using the standard silicon process technology commonly known to individuals skilled in the art. The sacrificial layer is either made of organic polymer such as photoresist or inorganic substance such as silicon oxide. Photoresist can be dry etched in oxygen plasma but can not withstand high temperature anneal like silicon dioxide can. Chemical-vapor deposited polysilicon film is used in integrated accelerometers and many other MEMS devices. Unfortunately, it must be annealed at a high temperature (.about.1000.degree. C.) to reduce stress, or its suspended structure will curl after the sacrificial layer is removed from underneath. The sacrificial layer is made of silicon dioxide whose removal is by wet etch in HF acid. Surface tension of the aqueous HF acid **solution** exerts forces on the **suspended** microstructure, which pulls the microstructure into contact with the substrate and causes them to stick together. To separate them without causing damages is difficult because the combination of adhesive forces and electrostatic forces is large compared to the strength of the thin films. Another drawback is the metal interconnect in the integrated control circuits can not withstand the high temperature anneal. Therefore, it must be formed after the polysilicon suspended microstructure is formed. Protecting the suspended microstructure during interconnect process and the wet etch is a complex matter and entails the usage of costly state-of-the-art fabrication facilities.

Brief Summary Text - BSTX (9):

Therefore, it is highly desirable to combine the merits of both bulk and surface micro-machining techniques--such as **MEMS** devices employing suspended structure made from mono-crystalline silicon by surface micro-machining method. One example is surface micro-machined accelerometers made with silicon-on-insulator (**SOI**) wafers, wherein thick mono-crystalline silicon is bonded to another silicon wafer with silicon oxide insulator in between. The suspended structure can be made much thicker than mono-crystalline for increased proof mass. However, **SOI** wafers are much more expensive than the regular wafers and its production employs a high temperature process that is not compatible with integrated circuits and dry-etchable sacrificial layers. It would be of great advantage if the sacrificial layer were dry-etchable like organic polymers. Hence, there is a strong need in the industry to overcome the aforementioned shortcomings of the present art.

Detailed Description Text - DETX (2):

Reference is now made to FIG. 1, wherein the accelerometer embodiment of the present invention is depicted. This accelerometer **MEMS** device has an x-axis accelerometer 101 and a z-axis accelerometer 102 and a substrate 30. The accelerometers are fabricated from a doped mono-crystalline silicon wafer. The substrate comprises passive or active electrical components such as signal processing circuitry, electrical connections, and capacitive plates. The substrate, if conductive, may also be used as a capacitive plate. The x-axis accelerometer 101 defines (1) a suspended structure comprising central beam 14, a plurality of suspended fingers 16 extending transversely therefrom, two narrow, meandering springs 12, and pads 17, which are bonded to the substrate with a thin layer of organic adhesive 20; (2) a stationary structure comprising two side beams 22, a plurality of stationary fingers 18 extending transversely therefrom that are positioned parallel and adjacent to each said suspended fingers 16. The side beams 22 are also bonded to the substrate with adhesive layer 20. All said fingers and beams are electrically conductive because of doped silicon therein. When the stationary fingers 18 are charged to a different voltage than the suspended bridge, a capacitive voltage exists between each stationary finger and its adjacent bridge finger. When there is acceleration along the x-axis, the suspended beam 14 and fingers 16 move relative to the stationary fingers 18, resulting in a change in the capacitive voltage, which measures the acceleration in the x-axis.

Detailed Description Text - DETX (9):

In addition to accelerometers, the present microstructure can be used for light valves or actuators. For example, if a voltage is applied to capacitive metal plate 40, the suspended plate 10 can move or rotate according to the applied voltage and configuration of the springs. An incident light is reflected in a different direction or phase according to the movement of the suspended structure. Similarly, the movement can actuate other mechanisms to constitute an actuator. Additionally, the present microstructure is not limited to one layer of mono-crystalline silicon 10. More layers of silicon can be bonded to the existing layer to constitute a multi-layered structure for more sophisticated **MEMS** devices.

DOCUMENT-IDENTIFIER: US 20040094510 A1

TITLE: Fluorinated surfactants for aqueous acid etch solutions

---------- KWIC ---------

Summary of Invention Paragraph - BSTX (16):
[0012] In another aspect, this invention relates to an etch process for substrates by contacting a substrate with a homogeneous etch **solution** comprising the fluorinated surfactant and acid for a time sufficient to achieve a predetermined degree of **etching**. In a preferred embodiment, this invention relates to a etch process for substrates by contacting an oxidized silicon substrate with a homogeneous etch **solution** comprising the fluorinated surfactant, HF and/or onium fluoride complex for a time sufficient to achieve a predetermined degree of **etching**. The present invention provides an etch **solution** with low surface tension that easily penetrates the intricate microstructures and wets the surfaces on silicon substrates. If desired, the etch process may further comprise the step of **rinsing** the etch **solution** from the surface of the etched substrate, and the step of drying the substrate.

Summary of Invention Paragraph - BSTX (52):
[0045] The invention provides a process for **etching** a substrate by contacting the substrate with the etch **solution** of the invention for a time and at a temperature sufficient to effect the desired degree of **etching**. Preferably, the substrate is an oxidized silicon substrate and the etch **solution** is a buffered oxide etch **solution** as described herein. Normally an oxidized silicon substrate is etched at 15 to 40.degree. C. If desired, the etch process may further comprise the step of **rinsing** the etch **solution** from the etched substrate. In one embodiment, the **solution** may be rinsed with water, and preferably deionized water. In another embodiment, the etch **solution** is slowly replaced with deionized water in a gradient etch process.

DOCUMENT-IDENTIFIER: US 20040065550 A1

TITLE: Electrochemical fabrication methods with enhanced post deposition processing

---------- KWIC ---------

Detail Description Paragraph - DETX (25):

[0072] The C-38 wet **etching** process is followed by a drying process to remove the liquid in the microstructure. Because of the surface tension of the **rinse** water, the released free-standing structures can tend to stick to the substrate. Once a structure is attached to the substrate by sticking, the mechanical force needed to dislodge it usually is large enough to damage the structure. In some MEMS processes, it has been proposed that this problem be overcome by use of freezing-sublimation or a CO.sub.2 supercritical drying process. However, these techniques can be process intensive, time consuming and often require sophisticated high-pressure apparatus. In electrochemical fabrication, a relatively simple method is preferred. After **rinsing** the part, it is immediately transferred into an alcohol **solution** where the alcohol is made to replaces the water in the structure. The structure is then immediately transferred to an oven at .about.60.degree. C. for 5-10 minutes to evaporate the alcohol and dry the structure.